

## CLEAN VERSION OF AMENDED CLAIMS

C1  
54  
DP  
C2

63. A method according to claim 99 wherein the catalyst is included as a component of the substrate resulting from mixing said catalyst in bulk with the material forming said substrate.

71. A method according to claim 99 wherein the catalyst is stable in the presence of moisture and oxygen and can initiate polymerization of the metathesizable material upon contact at room temperature.

72. A method according to claim 99 wherein the metathesizable material includes at least one reactive unsaturated functional group.

Sub  
DP  
C3

93. A method according to claim 99 wherein step (b) further comprises contacting the substrate surface multiple times with the same or different metathesizable material, allowing a metathesis product to be formed each said time as a coating from contacting active sites on the product surface.

## CLEAN VERSION OF ADDED CLAIMS

C4 99. A method for providing a coating on a substrate surface comprising: (a) providing a metathesis catalyst at the substrate surface; and

(b) contacting said catalyst on the substrate surface with a coating by printing, spraying, dipping, brushing, wiping, or roll coating of a material that undergoes a metathesis reaction, and (c) forming a coating on said substrate surface from the product of said metathesis reaction.

100. The method of claim 99 wherein said metathesizable material is a component of a paint.

101. The method of claim 99 wherein said contacting of said catalyst is by printing wherein said printing is on predetermined selected areas on said substrate.

102. The method of claim 99 wherein said catalyst is spray-applied, and said metathesizable material is spray-applied.

103. The method of claim 102 wherein said catalyst and said metathesizable material are spray-applied simultaneously.

Sub Div 104. A method for providing a coating on the outermost portion of a substrate, said coating is uniform, conforming to the outermost surface of said substrate, said method comprising:

(a) providing a metathesis catalyst at the substrate surface; and contacting the catalyst on the substrate surface with a material that undergoes a metathesis reaction to form a coating of the product of said metathesis reaction on said substrate.

105. A method according to claim 104 wherein the coating is formed directly on the substrate surface.

C4 <sup>SUB</sup> D127 106. A method according to claim 99 wherein the coating has a thickness that is less than the thickness of the substrate.

107. A method according to claim 104 wherein the coating has a thickness that is less than the thickness of the substrate.

108. A method according to claim 104 wherein the substrate comprises a substantially cured elastomeric material.

109. A method according to claim 108 wherein the elastomeric material is a thermoplastic elastomer.

110. A method according to claim 104 wherein step (b) occurs at room temperature.

111. A method according to claim 104 wherein steps (a)-(b) occur at room temperature.

112. A method according to claim 104 wherein step (a) comprises applying a catalyst onto the substrate surface.

113. A method according to claim 112 wherein the catalyst is dissolved or mixed into a liquid carrier fluid.

114. A method according to claim 112 wherein the catalyst is included as a component in a multi-component composition.

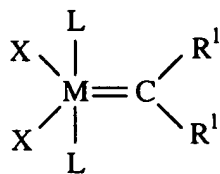
115. A method according to claim 104 wherein the catalyst is included as a component of the substrate resulting from mixing said catalyst in bulk with the material forming said substrate.

116. A method according to claim 108 wherein the elastomeric material is selected from natural rubber, polychloroprene, polybutadiene, polyisoprene, styrene-butadiene copolymer rubber, acrylonitrile-butadiene copolymer rubber, ethylene-propylene copolymer rubber, ethylene-propylene-diene terpolymer rubber, butyl rubber, brominated butyl rubber, alkylated chlorosulfonated polyethylene rubber, hydrogenated nitrile rubber, silicone rubber, fluorosilicone rubber, poly(n-butyl acrylate), thermoplastic elastomer and mixtures thereof.

117. A method according to claim 104 wherein the catalyst is selected from at least one of a rhenium compound, ruthenium compound, osmium compound, molybdenum compound, tungsten compound, titanium compound, niobium compound, iridium compound and  $\text{MgCl}_2$ .

118. A method according to claim 117 wherein the catalyst is selected from a ruthenium compound, a molybdenum compound, an iridium compound and an osmium compound.

119. A method according to claim 118 wherein the catalyst has a structure represented by



wherein M is Os, Ru or Ir; each  $\text{R}^1$  is the same or different and is H, alkenyl, alkynyl, alkyl, aryl, alkaryl, aralkyl, carboxylate, alkoxy, alkenylalkoxy, alkenylaryl, alkynylalkoxy, aryloxy, alkoxycarbonyl, alkylthio, alkylsulfonyl or alkylsulfinyl; X is the same or different and is an anionic ligand group; and L is the same or different and is a neutral electron donor group.

120. A method according to claim 119 wherein X is Cl, Br, I, F, CN, SCN, or  $\text{N}_3$ ; L is  $\text{Q}(\text{R}^2)_a$  wherein Q is P, As, Sb or N;  $\text{R}^2$  is H, cycloalkyl, alkyl, aryl, alkoxy, arylate or a heterocyclic ring; and a is 1, 2 or 3; M is Ru; and  $\text{R}^1$  is H, phenyl, -

CH=C(phenyl)<sub>2</sub>, -CH=C(CH<sub>3</sub>)<sub>2</sub> or -C(CH<sub>3</sub>)<sub>2</sub>(phenyl).

121. A method according to claim 120 wherein the catalyst is a phosphine-substituted ruthenium carbene.

122. A method according to claim 121 wherein the catalyst is bis(tricyclohexylphosphine)benzylidene ruthenium (IV) dichloride.

123. A method according to claim 104 wherein the catalyst is stable in the presence of moisture and oxygen and can initiate polymerization of the metathesizable material upon contact at room temperature.

124. A method according to claim 107 wherein the metathesizable material includes at least one reactive unsaturated functional group.

125. A method according to claim 124 wherein the metathesizable material comprises an olefin.

126. A method according to claim 125 wherein the metathesizable material is selected from ethene,  $\alpha$ -alkene, acyclic alkene, acyclic diene, acetylene, cyclic alkene and cyclic polyene and mixtures thereof.

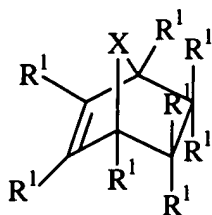
127. A method according to claim 104 wherein the metathesizable material comprises a cycloolefin.

128. A method according to claim 127 wherein the metathesizable material is a monomer or oligomer selected from norbornene, cycloalkene, cycloalkadiene, cycloalkatriene, cycloalkatetraene, aromatic-containing cycloolefin and mixtures thereof.

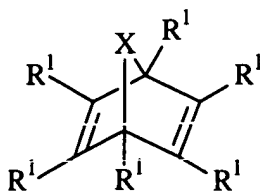
129. A method according to claim 128 wherein the metathesizable material comprises a norbornene having a structure represented by



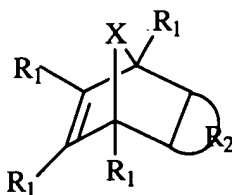
Cf



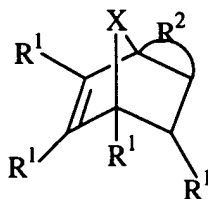
or



or



or



wherein X is  $\text{CH}_2$ ,  $\text{CHR}^3$ ,  $\text{C}(\text{R}^3)_2$ , O, S,  $\text{N-R}^3$ ,  $\text{P-R}^3$ ,  $\text{O=P-R}^3$ ,  $\text{Si}(\text{R}^3)_2$ ,  $\text{B-R}^3$  or  $\text{As-R}^3$ ; each  $\text{R}^1$  is independently H,  $\text{CH}_2$ , alkyl, alkenyl, cycloalkyl, cycloalkenyl, aryl, alkaryl, aralkyl, halogen, halogenated alkyl, halogenated alkenyl, alkoxy, oxyalkyl, carboxyl, carbonyl, amido, (meth)acrylate-containing group, anhydride-containing group, thioalkoxy, sulfoxide, nitro, hydroxy, keto, carbamato, sulfonyl, sulfinyl, carboxylate, silanyl, cyano or imido;  $\text{R}^2$  is a fused aromatic, aliphatic or heterocyclic

cf or polycyclic ring; and  $R^3$  is alkyl, alkenyl, cycloalkyl, cycloalkenyl, aryl, alkaryl, aralkyl or alkoxy.

130. A method according to claim 129 wherein the metathesizable material comprises ethyridenenorbornene monomer or oligomer.

131. A method according to claim 104 wherein the metathesizable material is in the form of a liquid.

132. A method according to claim 104 wherein the metathesizable material is a component of a multi-component composition.

133. A method according to claim 104 wherein the catalyst is applied in the form of an aqueous solution or mixture and the metathesizable material is applied in the form of a liquid that is substantially 100 percent reactive.

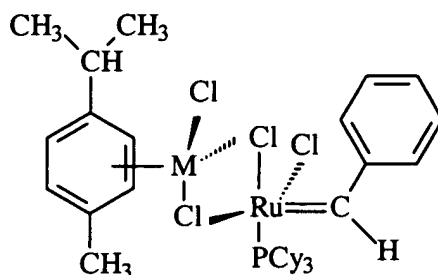
134. A method according to claim 104 wherein the method is substantially free of the use of volatile organic solvents.

135. A method according to claim 104 wherein step (a) comprises applying a ruthenium catalyst in a liquid carrier to the substrate surface and step (b) comprises applying a metathesizable liquid norbornene monomer to the catalyst-applied substrate surface.

136. A method according to claim 104 wherein step (b) further comprises contacting the substrate surface multiple times with the same or different metathesizable material, allowing a metathesis reaction to form a polymerized product each said time, resulting in a multi-layered coating.

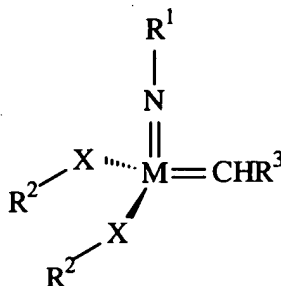
137. A method according to claim 136 wherein an active amount of catalyst remains on the substrate surface after each successive coating sufficient to polymerize the subsequent application of the metathesizable material.

138. A method according to claim 118 wherein the catalyst comprises a bimetallic catalyst having a structure represented by



wherein M is Ru, Os or Rh.

139. A method according to claim 118 wherein the catalyst has a structure represented by



wherein M is Mo or W; X is O or S; R<sup>1</sup> is an alkyl, aryl, aralkyl, alkaryl, haloalkyl, haloaryl, haloaralkyl, or a silicon-containing analog thereof; R<sup>2</sup> are each individually the same or different and are an alkyl, aryl, aralkyl, alkaryl, haloalkyl, haloaryl, haloaralkyl, or together form a heterocyclic or cycloalkyl ring; and R<sup>3</sup> is alkyl, aryl, aralkyl or alkaryl.

140. The method of claim 104 wherein said metathesizable material is a component of a paint.



Cf 141. The method of claim 104 wherein said contacting of said catalyst is by printing wherein said printing is on predetermined selected areas on said substrate.

142. The method of claim 104 wherein said catalyst is spray-applied, and said metathesizable material is spray-applied.

143. The method of claim 142 wherein said catalyst and said metathesizable material are spray-applied simultaneously.

---